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POWER SUPPLIES UNLIMITED

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NJE CORPORATION Kenilworth, New Jersey

INSTRUCTION MANUAL

FOR

HH-LINE

HIGH VOLTAGE POWER SUPPLY

PROPERTY OF ENGINEERING
TEST EQUIPMENT
CROSLEY, DIV. OF AVCO

ITEM.....COPY.....

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WARNING

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED BY OPERATING PERSONNEL. EXTREME CAUTION SHOULD BE EXERCISED WHEN WORKING WITH THIS EQUIPMENT.

SECTION I

SPECIFICATIONS AND DESCRIPTIONS

1-1. GENERAL: The HH-Line high voltage DC power supplies are designed for industrial applications where reliability and long life are important. Adequate ventilation and correct placement of hot-spot and high voltage components, conservative design of all circuit elements, and self-limiting protection against brief overloads should result in a long, trouble-free life in normal industrial service. Low corona levels are insured by proper spacing of components, and by the use of oil insulation above 30KV. The NJE High Voltage HH line power supplies are grouped into the following categories

a) HH Models: Air insulated, unregulated, 2500-5000 watts output power capability.

b) HHO Models: Same as (a), but oil insulated.

c) HHMR, HHOMR Models: Same as (a) and (b) respectively, but regulated to + 0.5% line and load.

d) 3H, 3HO, 3HMR, 3HOMR Models: Same as (a), (b) and (c) respectively, but with approximate 10 kilowatt output power capability.

e) 4H, 4HO, 4HMR, 4HOMR Models: Same as (a), (b) and (c) respectively, but with approximate 15 kilowatt output power capability.

1-2. Model Options: In addition to the standard model numbers listed above, the the following options are also available in HH-line equipment.

a) F: An "F" following the standard model number signifies "Fine Control". 0.03% output voltage resolution may be achieved.

b) R: An "R" following the standard model number signifies "Low Ripple" a ripple attenuation of 4:1 over standard models is provided.

c) R; Ripple reduction of approximately 5:1 ratio is available on all models at a nominal price. In most cases, no increase in physical size is required. Add suffix "R" to the model number. Larger reductions are readily available. Please consult local representaive, or factory, on your particular requirements.

d) V: A "V" following the standard model number signifies "Wide Range overvoltage trip". The overvoltage trip range for "V" models is 40% to 110% of nominal output voltage.

1-3. Physical Configuration: All HH-Line power supplies are built in subassemblies consisting of control sections and a high voltage section, and are housed in a deluxe relay rack type cabinet. See the rating chart for individual sizes.

The high-voltage section for 50KV and over models is housed in an oil-filled tank. This tank has been designed to provide easy servicing. An angle-iron frame is attached to the tank cover, and is used to mount the high-voltage components. When the cover is unbolted from the tank and lifted, the entire high-voltage section is removed from the oil. Port holes are provided in the cover for quick replacement of tubes, (where used) and for reversing polarity. Eyebolts in the cover allow for easy handling of the entire tank, or the frame alone. The cover is well-gasketed, enabling the unit to be moved without danger of spilling oil. A 10-foot interconnecting cable has been provided for remote operation of the high-voltage unit.

1-4. Meters: Two rectangular 3-1/2" meters are provided on the control panel. The kilovoltmeter has three ranges: 25%, 50% and 100%, approximately, of rated output voltage. The milliameter has ranges of 10%, 40% and 100%, approximately, of rated output current. These meters are hand-calibrated to 2% at the factory, and can be recalibrated at any time by screw driver-adjustable potentiometers which are part of the meter circuit.

Both meters are fully protected against overload on each range, and also when switching between ranges, by semiconductors. The kilovoltmeter reads the output voltage through a multiplier resistor connected directly to the high-voltage output terminal to assure a load voltage reading unaffected by internal regulation. The load current is measured in the ground return of the high voltage circuits. The kilovoltmeter current drain does not affect the milliammeter reading since the kilovoltmeter ground return is connected above the milliammeter in the ground return circuit.

1-5. Polarity: A pair of bus bar jumpers in the high voltage section permits reversing the polarity of the output voltage as desired. On some units, the entire rectifier assembly is reversed for polarity reversal.

1-6. Protective Devices: Over-voltage and over-current protective devices are provided which automatically open the primary circuit when the output voltage or current exceeds the preset cut-off value. The high-voltage is immediately shut off and appropriately identified warning lamp on the front panel is illuminated. A reset button on the panel permits restoration of the circuits to pre-operation condition after correction of the fault.

1-7. Self-Holding Primary Contactor: This device is push-button controlled, and serves to prevent the supply from automatically re-energizing after a line failure, blown fuse, overload, etc., has been corrected. When its holding circuit is interrupted, the contactor opens and will remain open until the HIGH VOLTAGE START button is pressed.

1-8. "Zero Reset Open" Interlock: This device prevents energizing the equipment, unless the voltage control knob is first turned back to zero, precluding the possibility of sudden application of high potentials. Each time the unit is energized, the output voltage will be initially zero, and must be raised to the desired potential by rotating the voltage control knob. In the case of MR models, the regulating system automatically resets to zero each time the unit is re-energized.

1-9. Output Shorting Switch: Whenever the power supply is shut off, a heavy-duty gravity-operated switch immediately short-circuits the output capacitors, removing the possibility of damage or injury that might result from accidental contact with output terminals or load circuit.

Input: Either 115 volts + 10%, 60 cycles per seconds, single phase, or 208/220 volts + 10%, 60 cycles per second, single or three phase. See rating chart below.

Output: Continuously variable from zero to rated voltage at no load to rated load conditions. See rating chart below.

Ripple: 1% RMS at any condition. 0.25% RMS available on "R" models.

Regulation: Line:

None provided on basic models. Output voltage varies directly with line voltage.

On MR models, line and load regulation is approximately + 0.5% from no load to full load or for + 10% line variations.

Load:

Less than 15% on HH models. + 0.5% from no load to full load on HHMR models.

Response Time: The MR models are controlled by a motor-driven variable autotransformer to achieve the specified regulation. A 10% line change is corrected in from 2 to 2.5 seconds. A full load change is corrected in from 2 to 4 seconds. Smaller variations are corrected in proportionately less time.

Internal Resistance: Consult NJE Corp. Engineering Dept.

Polarity: Either positive or negative with respect to ground.

Termination: A barrier type terminal strip, in the control section provides terminals for input and external interlock connection. A high voltage output cable is provided on all units. On two piece units, an interconnection cable is provided.

Protection: External interlock provision, zero-start interlock, safety interlock overvoltage trip from 80 to 110% of maximum rating & overcurrent trip from 20 to 120% of maximum rating, automatic gravity fail-safe output grounding, and dead-front control elements are provided to make unit safe for operating personnel. Overvoltage tripping adjustment range can be increased to approximately 25% to 110% at a nominal charge. Add suffix "V" for this feature. Wider range adjustment available on special request. Please consult local representative, or factory.

Meters: Three range output kilovoltmeter and milliammeter are both 3-1/2" rectangular 2% accuracy meter.

Resolution: Output voltage resolution (fine control) of 0.03% can be provided at an additional nominal charge on all units. On units listed with a 14" high control section, the height increases to 17 1/2". Other units are not affected. Add suffix "F" for this feature. Please consult local representative, or factory.

PANEL ELEMENT:

AC "MAIN POWER" circuit breaker
AC line fuses in extraction post
AC " MAIN POWER" pilot lamp
"INTERLOCK OPEN" lamp
"TIME DELAY ON" pilot lamp
"OFF-RESET" push button
OVERVOLTAGE trip lamp
OVERCURRENT trip lamp
"ZERO RESET OPEN" lamp
HIGH VOLTAGE ON lamp
"OUTPUT VOLTAGE ADJUST" KNOB
CONTROL fuse in extractor post
OVERCURRENT TRIP ADJUST knob -
OVERVOLTAGE TRIP ADJUST knob - dual concentrip potentiometer
KILOVOLTMETER range switch
MILLIAMMETER range switch
OUTPUT VOLTMETER
OUTPUT MILLIAMMETER

ENVORONMENTAL CONDITIONS:

These power supplies will operate continuously to 35°C with humidity up to 50% and at altitude up to 5000 ft. For operation outside the above conditions consult the NJE Sales Department.

Model No.	Dimensions, Inches		Height Added by Casters	Approx Shipping Weight Pounds
	Control Sect. H x W x D	High Voltage oil tank sect. H x W x D		
HH2.5-1000	68 x 22 x 18		5 5/8"	520
HH2.5-2000	68 x 22 x 24		5 5/8"	1,000
3H2.5-4000	68 x 22 x 24		5 5/8"	1,250
4H2.5-6000	68 x 22 x 24	68 x 22 x 24[2]	5 5/8"	1,250[1]
HH5-500	68 x 22 x 18		5 5/8"	520
HH5-1000	68 x 22 x 24		5 5/8	1,000
3H5-2000	68 x 22 x 24		5 5/8	1,250
4H5-3000	68 x 22 x 24	68 x 22 x 24[2]	5 5/8"	1,250[1]
HH10-250	68 x 22 x 18		5 5/8"	520
HH10-500	68 x 22 x 18		5 5/8	1,000
3H10-1000	68 x 22 x 24		5 5/8"	1,250
4H10-1500	68 x 22 x 24		5 5/8"	1,250
HH15-150	68 x 22 x 18		5 5/8"	520
3H15-500	68 x 22 x 24		5 5/8"	1,250
4H15-1000	68 x 22 x 24	68 x 22 x 24[2]	5 5/8"	1,250[1]
HH20-250	68 x 22 x 24		5 5/8"	1,000
3H20-500	68 x 22 x 24		5 5/8"	1,250
HH25-100	68 x 22 x 18		5 5/8"	520
HH30-150	76 x 33 x 24		5 5/8"	1,000
3H30-250	76 x 33 x 24		5 5/8"	1,250
4H30-500	68 x 22 x 24	68 x 22 x 24[2]	5 5/8"	1,250[1]
HHO50-50	28 x 22 x 18	29 1/2 x 22 x 22	5 5/8"	630
3HO60-100	28 x 22 x 18	30 x 30 x 30	5 5/8"	850
4HO60-250	68 x 22 x 24	36 x 36 x 36	Incl.	1,250
HHO150-10	28 x 22 x 18	34 x 26 1/2 x 22	5 5/8"	630
HHO150-20	28 x 22 x 18	30 x 30 x 30	5 5/8"	850
HHO250-5	28 x 22 x 18	48 x 45 x 43	10 1/8"	1,200

Table 1-1

Note 1: Air insulated cabinet

Note 2: Weight per section

Model No. No.	Voltage Range KV	Max Continuous Current MA	Input Voltage Phase Frequency	Load Regulation %	Ripple % RMS
HH2.5-1000	0-2.5	1000	208/220-1-60[1]	10	1
HH2.5-2000	0-2.5	2000	208-3-60	10	1
3H2.5-4000	0-2.5	4000	240-3-60	10	1
4H2.5-6000	0-2.5	6000	240-3-60	7.5	1
HH5-500	0-5.0	500	208/220-1-60[1]	10	1
HH5-1000	0-5.0	1000	208-3-60	10	1
3H5-2000	0-5.0	2000	240-3-60	10	1
4H5-3000	0-5.0	3000	240-3-60	7.5	1
HH10-250	0-10	250	208/220-1-60[1]	10	1
HH10-500	0-10	500	208-3-60	10	1
3H10-1000	0-10	1000	240-3-60	10	1
4H10-1500	0-10	1500	240-3-60	7.5	1
HH15-150	0-15	150	208/220-1-60[1]	10	1
3H15-500	0-15	500	240-3-60	10	1
4H15-1000	0-15	1000	240-3-60	7.5	1
HH20-250	0-20	250	208-3-60	10	1
3H20-500	0-20	500	240-3-60	10	1
HH25-100	0-25	100	208/220-1-60[1]	10	1
HH30-150	0-30	150	208-3-60	10	1
3H30-250	0-30	250	240-3-60	10	1
4H30-500	0-30	500	240-3-60	7.5	1
HHO50-50	0-50	50	115-1-60	15-25	3.5
3HO60-100	0-60	100	240-3-60	10	1
4HO60-250	0-60	250	240-3-60	7.5	1
HHO150-10	0-150	10	115-1-60	15-25	4
HHO150-20	0-150	20	208/220-1-60	15	3.5
HHO250-5	0-250	5	115-1-60	15-25	3.5

Table 1-2

Note 1: All 208/220 volt, single phase unit are wired and shipped as 208 volt units unless customer specifies 220 volt on purchase order. Example: For 220 volt operation specify Model HH-25-100-220.

Note 2: 3-phase inputs require 4-wire system.

SECTION II

INSTALLATION AND OPERATION

2-1. FOR AIR-INSULATED UNITS.

a. Remove the masking tape used to secure the plate leads for shipment.

b. Install the rectifiers in their sockets, and close in the tube clamps. (Clamps not supplied for screw-in and twist-in rectifiers).

c. Connect the plate leads to the plate caps of the rectifier tubes.

2-2. FOR OIL-INSULATED UNITS.

a. Lift the frame and cover out of the tank and set the unit down.

b. Cut the cords used to secure the plate leads for shipment.

c. Install the rectifiers in their sockets.

d. Connect the plate leads to the plate caps of the rectifier tubes.

e. The tank is provided with fittings for valves, and these may be installed if desired, If not, oil may be poured in directly through the top, and pumped, syphoned, or bailed out when required.

f. Fill the tank to the oil level line on the inside of the tank (about 2-1/2" from the top) with high grade transformer oil of at least 25KV test rating. When pouring the oil in through the top, avoid splasing as much as possible, since this causes aeration of the oil. When pumping, the oil should enter at the lower valve fitting. See transformer oil application notes.

g. Install the output cable in the jack on the frame and screw the clamp fitting down on the cover.

h. Lower the frame and cover into the tank slowly to avoid splashing.

i. Bolt the lid down, using a hand wrench to tighten the bolts.

j. Screw the interconnecting cable in place at both the control chassis and tank ends.

2-3 WIRING AND PRELIMINARY CHECKS:

1. Ascertain that the control-to-high voltage interconnecting cable is tight.

2. Wire terminals TB1-6 and TB1-7 to an external safety switch. This switch should be shorted in the safe-operating position. If no safety circuit is desired, then wire in a jumper across these terminals.

3. Check that the door interlock plug is properly seated.

4. Wire TB1 to a source of input power as specified on the schematic diagram. Connect a good external ground TB1-5. # 12 gauge wire is adequate for all HH-Line supplies.

5. BE SURE TO GROUND THE EQUIPMENT TO A GOOD EXTERNAL GROUND at TB1 and also at ground stud on the cabinet. Use at least 12 gauge wire.

6. POLARITY SELECTION

   a. Set the output voltage polarity jumpers as desired.

   b. Set METER POLARITY SELECTOR switch on the control chassis side accordingly.

   c. Set the REGULATOR POLARITY SELECTOR accordingly on MR Models.

7. Connect the load end of the output cable to the load.

8. The supply is now ready for operation.

2-4. Prelimary Setup- After units has been unpacked and installed (see Sections 2-1 and 2-2 above) the supply is now ready for operation. Prior to turning the unit on, the following conditions should apply:

ITEMS

1: Set OUTPUT VOLTAGE CONTROL (T301) knob to extreme counterclockwise position.

2: Set OVERVOLTAGE TRIP CONTROL (R103A) knob and OVERCURRENT TRIP CONTROL (R103B) knob to extreme clockwise position.

3. Set AC Breaker (CB301) to the "ON" position.

4. Set KILOVOLT range switch (S104) and MILLIAMMETER range switch (S105) to the range required for the output expected.

5. Ascertain polarity status of unit by referring to paragraph 2-6.1 and 2-6.2 POLARITY REVERSAL.

2-5. OPERATION:

Items:

1. Momentarily depress the HIGH VOLTAGE ON button. The HIGH VOLTAGE ON lamp should light.

2. Slowly rotate the OUTPUT VOLTAGE control knob clockwise, observing the output meters until the desired voltage and current levels are reached.

3. Slowly rotate the OVERVOLTAGE TRIP CONTROL until the supply turns off. The HIGH VOLTAGE ON lamp should go out and the OVERVOLTAGE lamp should light, provided output is from 80 to 110% of supply rating.

4. Rotate the OVERVOLTAGE TRIP CONTROL slightly clockwise. The OVERVOLTAGE TRIP CONTROL is now set.

5. Momentarily depress the OFF-RESET button. The OVERVOLTAGE lamp should go out and the SET TO ZERO lamp should light.

6. Rotate the OUTPUT VOLTAGE control knob to the extreme counter-clockwise position. The ZERO RESET OPEN lamp should now go out.

7. Repeat items (1) and (2).

8. Slowly rotate the OVERCURRENT TRIP CONTROL knob until the supply goes off. The HIGH VOLTAGE ON lamp should go out and the OVERCURRENT lamp should light provided load current is from 20 to 120% of supply rating.

9. Rotate the OVERCURRENT TRIP CONTROL slightly clockwise. The OVERCURRENT TRIP CONTROL is now set.

10. Momentarily depress the OFF-RESET button. The OVERCURRENT lamp should go out and the SET TO ZERO lamp should light.

11. Repeat item (6).

12. Repeat items (1) and (2).

13. The supply is now ready for use.

2-6 OUR INSULATED UNITS: Polarity reversal may be accomplished as follows:

ITEMS:
2-6.1

1. Remove front control panel mounting screws for control panel and and slide control section out about three inches(3").

2. Set POLARITY switch to the desired position.

3. Slide control panel back in place and replace mounting screws.

4. Open rear door of cabinet and locate polarity reversing bars P201-P202, and P203-P204.

5. Remove the two reversing bars and re-insert them in the position for the polarity desired as indicated on the schematic diagram at the rear of the manual.

6. Close rear door.

7. For HMR units.

2-6.2 OIL INSULATED: Polarity reversal may be accomplished as follows:

1. Same as Par 2-6.1 item 1

2. Same as Par 2-6.1 item 2

3. Same as Par 2-6.1 item 3

4. Remove cover of tank

5. Lift out the rectifier assembly.

6. Re-insert the rectifier assembly with the red square in the proper direction for the polarity desired, as indicated on the label on the cover of the tank.

7. Replace tank cover making sure all mounting hardware is replaced in its proper position.

2-7. For AC output, follow instruction on schematic diagram at the rear of the manual. for setting of reversing bars and/or rectifiers. POLARITY switch (S106) must be in AC position.

SECTION III

CIRCUIT DESCRIPTION AND THEORY OF OPERATION

The schematic diagram for the power supply will be found on a fold-out page at the rear of this manual. The circuit descriptions below refer to this diagram.

The heart of the power supply is the high-voltage circuitry in the central portion of the schematic diagram. All HH-Line units utilize the full-wave choke input filter bridge rectifier circuit, which includes a plate transformer T2, the rectifier tubes V1-V4 for single phase units, or V1-V6 for three phase units, and filter elements L1 and C1.

When the equipment is fully operative, power is applied to the primary of variable autotransformer T301. The adjustable output voltage is applied to the primary of plate transformer T2 which steps up this voltage to a high value and applies it to the rectifier tubes. The pulsating DC output of the rectifier stage is filtered by the LC network and applied through resistor R4 and the output terminal to the external load. The series resistors R4 limit the load current to a safe value in the event of an external short-circuit. Spark gaps, such as E1, are designed to short-circuit to ground any accidental discharges that may occur between the high-potential and low potential circuitry.

The remaining circuit elements shown on the diagram are employed to control, monitor and safeguard the above high-voltage circuitry, as explained in the following paragraphs.

APPLICATION OF PRIMARY POWER. Closing the MAIN POWER circuit breaker CB301 energizes the filaments of the rectifier tubes. Power is connected to the interlock circuits after a 60-second time delay. With the cabinet door interlock S11 properly closed, and the external safety interlock circuit (connected to TB1-6, 7) closed, control power is connected through the normally closed, OFF-RESET push-button S101 and the normally closed contacts of the over-voltage and over-current holding relays K101 and K102, to the zero reset circuit and lock-up contact K103A.

CONTACTOR AND ZERO RESET OPEN INTERLOCK CIRCUITS. Microswitch S301 is ganged with HIGH VOLTAGE CONTROL T301 and is closed when the control knob of T301 is turned to its extreme counter-clockwise (zero) position.

If the HIGH VOLTAGE START push-button S102 is pressed when T301 is not at zero, the ZERO RESET OPEN indicator lamp DS105 will light. With T301 at zero, however, S301 is closed, and the power contactor K301 is energized when S102 is pressed. The holding contact of contactor K103 bypasses both S301 and S102, so that K103 and K301 remain energized after the push-button is released and the T301 control knob has been rotated away from zero position. The main contacts of K301 connect line power to the primary of transformer T2. The HIGH VOLTAGE ON indicator lamp DS106 is energized by K103, The adjustable output of autotransformer T301 is applied to the primary of high-voltage transformer T2. Rotation of the T301 control knob on the front panel causes the high-voltage output to vary smoothly and continuously between zero and the rated maximum voltage.

In the MR models, the action is somewhat different. The circuit is so designed that when power reaches pilot light DS105, the ZERO RESET OPEN indicator the motor drive automatically recycles the main autotransformer T301 to zero. At this condition, the zero limit switch operates and bypasses the pilot light DS105 and brings the power to the HIGH VOLTAGE START push-button S102. The contactor and holding circuits are similar to the basic HH line units described above.

OUTPUT SHORTING SWITCH. Pressing the HIGH VOLTAGE START button also energizes relay K701, which is then held by the same holding circuit as is the main contactor K301. In the de-energized position, K701 short-circuits the high =voltage output terminals or load circuits during shutdown periods. When K701 is energized, this short circuit is removed, but since the relay armature return is gravity-operated, it stands ready to reapply the short circuit immediately upon malfunction or failure of the supply. Resistor R3 limits the short-circuit capacitor discharge current to a nondestructive value.

OVER-VOLTAGE CIRCUIT. Relay K104 is connected in series with multiplier resistor R2 and OUTPUT VOLTAGE meter M102 across the high voltage output. By mechanical adjustment this relay can be made to close its contacts when the output voltage of the supply exceeds the rated maximum by any chosen amount from 80-110% by means of overvoltage trip control R103A. When K104 closes its contacts, the coil of relay K101 is energized. Examination of the relay circuits will show that this causes the OVER-VOLTAGE indicator lamp DS103 to light, holds the coil of K101 in energized condition, and shuts down the high voltage by de-energizing K103, K701 and K301. To restore the equipment to operation, it is then necessary to rotate the voltage control knob back to zero, press the OFF RESET button S101, and then press the HIGH VOLTAGE START push-button S102.

OVERCURRENT CIRCUIT. Relay K102 is actuated by closure of the contacts of relay K105 which is energized when the load current exceeds a set value. This value can be adjusted between 20% and 120% of the rated maximum output current by means of overcurrent trip control R103B.

When K102 is energized it lights the OVERCURRENT indicator lamp DS104, establishes a hold circuit for its own coil and shuts down the high voltage circuits. After removing the cause of the excessive current drain, the equipment can be restored to operation as outlined for the over-voltage circuit above.

METERING CIRCUITS. The voltmeter is connected in series with multiplier resistors R2 and R104 direct to the high voltage output terminal, to permit monitoring the load voltage without introducing variations due to the regulation of the power supply. The voltmeter is returned to a point beyond the ammeter on the ground return, so that the current drawn by the voltmeter will not be registered on the ammeter.

The ammeter is connected in series with the ground return of the external load, and reads actual load current, with no error due to the kilovoltmeter drain.

Each meter is equipped with individual shunting potentiometers for each of the three meter ranges, to permit recalibration of the meters at regular periods.

POLARITY CONTROL: On the same chassis as the high-voltage rectifier tubes are a pair of bus-bar jumpers equipped with banana plugs (P1, P2, P3, and P4) on the schematic diagram. The mating jacks for these plugs are so arranged that the bus-bars can be removed, rotated 90 degrees, and reinserted to provide a reversal in output polarity. METER POLARITY switch S106, on the side of the control is then thrown to the appropriate position, so that the meters still read up-scale for an increase in current or voltage. On MR models an additional polarity selector on the Regulator chassis must also be switched when reversing polarity.

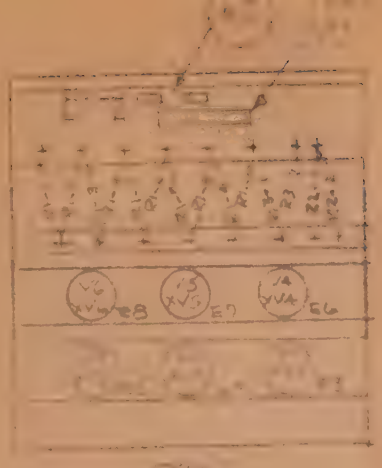
METER PROTECTORS. Semiconductor CR101 and CR102 are connected in parallel with the voltmeter and ammeter circuits, respectively, and are inoperative except when excessive voltage appears across the devices they protect. When the voltage reaches the conducting potential of the protective element, the device acts as a low impedance, and bypasses any additional currents which might otherwise damage the protected components.

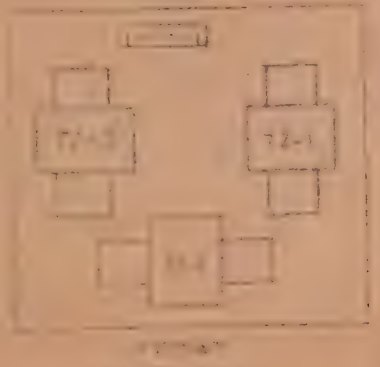
MOTOR REGULATOR CIRCUIT FOR MR MODELS. Feedback current of approximately 2 milliamperes DC level is fed to the grid of the amplifier stage V503. This is a balanced cathode follower stage in which the reference grid is at ground potential. A pair of 6A2 are used to hold the amplifier levels constant and to provide polarity reversal by returning the feedback divider network by means of the REGULATOR POLARITY SELECTOR switch S502 to either a positive or negative potential point with respect to ground.

When the output voltage varies for any reason such as a line or a load change, the balance at the grids of V503 is disturbed and the relay K502 which is the cathode follower load is energized. This is a balanced relay so that either the raise or lower contact will make in the motor drive system. The circuit is such that the "make" contact will try to restore the balance at the grids thereby providing regulating action.

Output voltage is controlled by potentiometer R505 which deliberately upsets the balance at the grids causing the regulating system to seek a new grid balancing point.

"F" MODELS. This option provides a vernier adjustment by means of a buck-boost transformer inserted in series with the primary of the high voltage transformer T2. A separate sub-assembly is added into the equipment for this option.





NEAR SIDE

R6-2 USED ON 3H25-4000 ONLY

R3 R6-1 R6-2 R1 2 A1

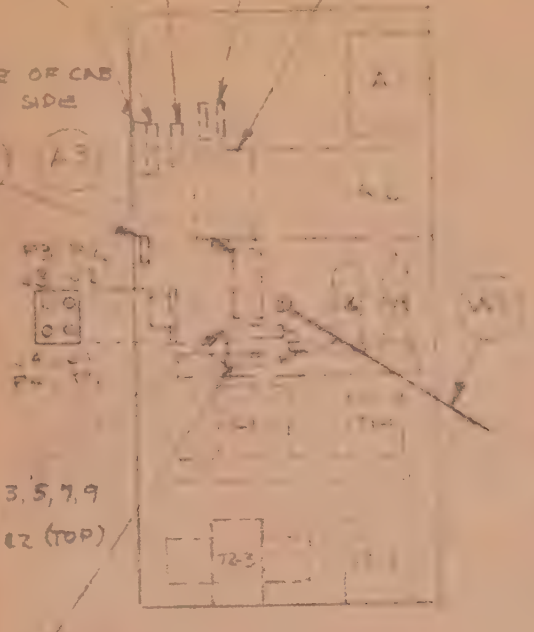
USED ON "MR" UNITS ONLY

A1 REGULATOR

USED ON "MR" UNITS ONLY

INSIDE OF CAB FAR SIDE

S1 A3



R1-1, 3, 5, 7, 9
R3-1
R2-1 & 2 (TOP)

R1-2, 4, 6, 8, 10
R3-2
BOTTOM

SIDE VIEW

ROLL TRUCK FOR "C" UNITS ONLY

FRONT VIEW

3H 2.5-4000
3H 10-1000

PARTS PLACEMENT

NJE DWG 10235

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CONTROL PANEL 1AX

CONTROL F101 8 AMP

TIME DELAY ON DS101 K106A K106

INTERLOCK OPEN DS102

S101 OFF RESET

R101 100K 2W

R118 100K 2W

R117 100K 2W

K104A K101A K101

DS103 OVERVOLTAGE

K105A K102A K102

DS104 OVERCURRENT

METER POLARITY S106A

S104 KILOVOLTMETER

M102 KV OUTPUT VOLTAGE

CR101 SM72

LOW MED HIGH

R104 1000 3W

R105 15K 2W

R106 5000 2W

R107 1000 2W

K104 R103A 100K 1W R102 270K 2W

TRIP CONTROL OVERVOLTAGE

S106B

TRIP CONTROL OVERCURRENT

R103B 100K 1W

C102 2UF 200V

R112 2700 2W

K105

RE 25 100W

TB101-1 -2 -3 -4 -5 -6 -7 -13 -14 -12 -6

S1

TB1 GRD EXT INTLK

A2 2AX-3 POWER PANEL

TB301-8 TB301-9 TB301-10 TB301-11 TB301-12

K301 S301 NC COM NO

S301 GANGED TO T301

OUTPUT VOLTAGE ADJUST T301

MAIN POWER CB301 30 AMP

DS301 MAIN POWER

T302 240 230 220 208 SEE NOTE 2

F301 30A K301A TB301-5

F302 30A K301B TB301-6

F303 30A K301C TB301-7

INPUT 240V 60 CPS 3 PH 3 WIRE SEE NOTE 2

TB301-1 TB301-2 TB301-3 TB301-4

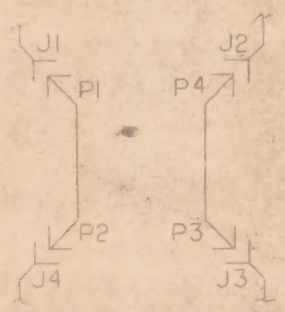
T1-1 T1-2 T1-3 T2-1 T2-2 T2-3

V1 6894 V4 6894

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
	-		

HIGH VOLTAGE START
S102
K103A
K103B
K103
DS106
HIGH VOLTAGE ON
S105 MILLIAMETER
M101
MA
OUTPUT CURRENT
LOW
MED
HIGH
C101 5UF 25V
CR102 SM72
R108 1000 3W
R109 2500 3W
R110 1000 2W
R111 200 2W
R116 2500 3W
-11
-9
-10
A3
K701
THV-A1
K701A
E1
E2
R1-1 THRU R1-10 10K 50W 10 IN SERIES
R2 7.5M 6W
R3-1 THRU R3-2 50K 50W 2 IN SERIES
V2 6894
V3 6894
V5 6894
V6 6894
J1
J2
P1
P2
SEE NOTE 1
P4
P3
J4
J3
E9
L1
R4-1 THRU R4-2 50 100W 2 IN PAR
W1
OUTPUT 0 TO 5 KV 0 TO 2000 MA
Y1
Z1
C1A 1.5UF 5KV
C1B 1.5UF 5KV

(S106 IN NEG. POSITION)



DETAIL A
NEG. POLARITY

600756

REV SYM

NOTES:

1. OUTPUT REVERSING BARS AND S106 SHOWN IN POSITIVE CONFIGURATION. FOR NEGATIVE CONFIGURATION, SEE DETAIL A.
2. FOR 208V, 3 PHASE, 4 WIRE OPERATION; CONNECT INPUT TO TB1-1, TB1-2 & TB1-3 AND NEUTRAL WIRE TO TB1-4. REWIRE T302 TO 208V TAP. OUTPUT VOLTAGE MUST BE DERATED BY 10%.

	UNLESS OTHERWISE SPECIFIED	DRAFTSMAN J. Suter	DATE 3-4-64	TITLE MODEL 3H-5-2000 SCHEMATIC DIAGRAM	NJE CORPORATION KENILWORTH, N.J. CODE IDENT. NO. 98380
	DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ±	DESIGNER			
	MATERIAL	CHECKER			DWG SIZE F — 600756
		ENGINEER PSR	3-4-64		
NEXT ASSY.	PROTECTIVE FINISH	APPROVED			SH 1 OF 1
APPLICATION	USED ON	DO NOT SCALE DWG		SCALE	WT

MANUFACTURER'S REPRESENTATIVES

*California, Los Angeles
Ault Associates
931 So. Prairie Avenue
Inglewood, California
OR 8-6144

California, San Francisco
Ault Associates
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Menlo Park, California
DA 6-1760

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8230 Mayrand Street
Montreal, Canada
REgent 9-5517

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TWinbrook 4-1955

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CLearwater 2-5604

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Ridgway Associates
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Cleveland 34, Ohio
(216) 749-6626

Penna., Philadelphia
Burlingame Associates, Ltd.
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Upper Darby, Pa.
JAckson 8-6080

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TA 3-5383(Dallas)

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Carey-Wolf Co.
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PE 8-1702

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OL 4-2114

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Seattle 15, Washington
LA 4-5170

Washington, D. C.
Burlingame Assoc., Ltd.
8218 Wisconsin Ave., N.W.
Washington 14, D. C.
OLiver 4-6400

*Local Service Centers.

Our Warranty:

N J E Corp. warrants each power supply manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replacing any defective parts thereof, except tubes, semi-conductors and fuses. This warranty is effective for five years after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started. Written permission must be obtained from the factory, before a supply may be returned for examination.

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Electronic Development & Manufacturing TELEFAX: FFP • TWX: (201 Area Code) 276-7630

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